

REMARKS

Claims 18-31, 33-36 and 38-44 are presently in the application. Claims 1-17, 32, 37 and 45-47 have been canceled.

The examiner's indication of allowable subject matter in claims 24, 31, 38, 39 and 44 is greatly appreciated.

Reconsideration of the rejection of claims 21, 25, 26, 34, 36 and 38-41 under 35 U.S.C. 112, second paragraph, is respectfully requested. Each of these claims has been amended to recite the originally claimed broader range. The claims are now in full compliance with the requirements of 35 U.S.C. 112, second paragraph.

Reconsideration of the rejection of claims 18-23, 25-30, 33-36 and 40-43 under 35 U.S.C. 103(a) as unpatentable over Schlaf et al (US 5,743,470) is respectfully requested.

The examiner acknowledges that Schlaf lacks a teaching of an injection nozzle having at least one injection orifice, a nozzle needle seat, a nozzle needle and an annular groove at the end of the nozzle needle oriented toward the nozzle needle seat and wherein the width of the annular groove is one-and-a-half times greater than the diameter of the injection orifice (3). The examiner is of the opinion, however, that it would have been obvious "to provide the width of the annular groove being one-and-a-half times greater than the diameter of the injection orifice, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art."

Applicant's specification teaches that in the partial stroke range of the nozzle needle, the annular groove in the end of the nozzle needle oriented toward the nozzle needle seat is decisive

for the throttle action of the injection nozzle. Since the annular grooves can be reproduced with high precision, there is very little variation in the throttling action of injection nozzles of the same design. For this reason, by measuring the operating behavior of an injection nozzle according to applicant's invention, the operating behavior of all other injection nozzles of the same design can be predicted with significantly greater precision and the control of the injection process can be correspondingly optimized. It is also taught that by providing an annular groove in the end of the nozzle needle oriented toward the nozzle needle seat with a width which is one-and-a-half times greater than the diameter of the injection orifice, the throttle action of the injection nozzle is influenced by the annular groove over a sufficiently large partial stroke range. Spec., page 6. This advantageous feature is clearly not taught or suggested by Schlaf et al.

Schlaf et al does not deal with the problem of the variation in injection quantity. This means that although grooves in the nozzle needle were known, it was the present applicant who discovered that using grooves for the reduction of the variation in injector quantity would be advantageous and it was the present applicant who discovered that providing a groove width one-and-a-half times greater than the diameter of the injection orifice was particularly advantageous.

A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. In re Antonie, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (The claimed wastewater treatment device had a tank volume to contractor area of 0.12 gal./sq. ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the

parameter optimized was not recognized in the art to be a result-effective variable.). The MPEP specifically instructs examiners that a particular parameter must first be recognized as a result-effective variable. See MPEP 2144.05.

The examiner asserts that Schlaf et al does recognize that the width of the groove (27) (see Fig. 2 in Schlaf) in the end of the nozzle needle in relation to the diameter of the injection orifice is a result-effective variable and cites col. 2, ll. 19-29 and col. 3, ll. 38-55 of the reference (the examiner characterizes these portions of Schlaf as disclosing the “depth relationship of the groove”). The examiner then states that “[t]he width of the groove would change as a result of the change in radius of the groove when determining the depth of the groove. Therefore, the width of the groove would at least meet the ‘1-1/2 times greater diameter of the injection orifice’ limitation within the radius range provided in Schlaf et al.”

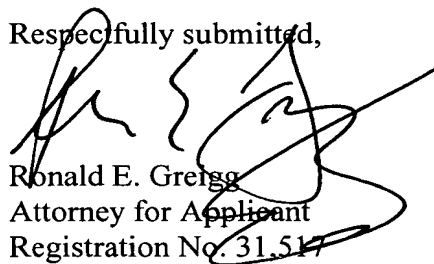
At col. 2, ll. 19-29 and col. 3, ll. 38-55, Schlaf simply teaches that the radii of curvature of the groove (27) are preferably in a range from approximately 0.2 to 0.8 mm, and the maximum spacing between the recess and the opposed wall face is preferably from 0.01 to 0.06 mm. Nowhere in Schlaf is there any discussion of a relationship between the radius, the width or the depth of the groove (27) and the diameter of the injection orifice (10). The examiner’s assertion that Schlaf et al recognizes that the width of the groove in the end of the nozzle needle in relation to the diameter of the injection orifice is a result-effective variable is without any factual support. Therefore, it is improper for the examiner to conclude that the prior art recognized that the width of the groove in the end of the nozzle needle in relation to the diameter of the injection orifice is a result-effective variable.

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In reply to Office action of January 21, 2005

In the present case, Schlaf et al does not recognize that the width of the groove (27) in the end of the nozzle needle in relation to the diameter of the injection orifice (10) is a result-effective variable. Thus, it is improper for the examiner to conclude that the particular relationship specified in claim 18 between the width of the groove and the diameter of the injection orifice is simply the discovery of optimum range. The examiner is clearly using the applicant's own teaching in making a rejection under 35 U.S.C. 103 which is not permissible.

Entry of the amendment and allowance of the claims are respectfully requested.

Respectfully submitted,



Ronald E. Greigg
Attorney for Applicant
Registration No. 31,517

GREIGG & GREIGG, P.L.L.C.
1423 Powhatan Street, Suite One
Alexandria, VA 22314

Tel. (703) 838-5500
Fax. (703) 838-5554

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